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By: **David R. Williams**, W. Jack Duncan, and Peter M. Ginter

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Abstract This study examines agency and market signals related to a sample of high-technology firms seeking an initial public offering (IPO). We test a model of the IPO offer process in high-technology firms. Results indicate that certain pre-market and primary market factors affect the offer price received by entrepreneurs and investors, while the secondary market factor did not. Our model may help entrepreneurs position their organization prior to and during the IPO process.

Keywords Signals · Initial public offering · High-technology industries

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1 Introduction

Coase (1937) described an organization as a “nexus of contracts.” This description is valid, and we believe there are no contracts more important for an organization than those creating the firm and providing for its early funding. Early funding often comes from a variety of sources including founders, family members, angel investors, venture capitalists, institutional lenders, and intermediaries such as underwriters associated with an initial public offering (IPO). In at least two of the above cases (entrepreneurs and venture capitalists and pre-IPO owners and underwriters) there is usually a transfer of equity directly related to the funding. These transfers provide the funding that allows for growth, acquisition of critical resources, and in some cases survival.

Pricing or valuation of the new venture is one of the most subjective and controversial topics to be negotiated by the entrepreneur and investors (Bouillet-Cordonnier 1992). Contracts associated with an IPO between the pre-IPO owners and underwriters result from a complex bargaining process and are comprised of two main parts: the offer price and the overall offer amount, which is the product of the offer price and the number of shares to be sold. For the pre-IPO owners the establishment of an equitable offer price is important because pre-IPO owners may not wish to “leave money on the table” and IPOs with low offer prices historically experience higher failure rates (Loughran and Ritter 2002). The total offer amount

is important because larger IPOs customarily experience less underpricing (Michaely and Shaw 1994).

The initial set of negotiations between pre-IPO owners (entrepreneurs and venture capitalists) is called the “pre-market” (Logue et al. 2002). The transfer of equity from the pre-market owners to underwriters takes place in the primary market. This study is mainly concerned with the primary market. The initial public offering by means of which the underwriter sells this equity to individual and institutional investors in an open, public market (e.g., NASDAQ, New York Stock Exchange) is the secondary market or aftermarket, which has been the focus of the majority of IPO research (McConaughy et al. 1996).

Within the secondary-market literature, the issue of mispricing or the difference between the offer price received by the pre-market owners and the stock price at the close of the first day of trading in the secondary market has received the most attention (Certo et al. 2001; Daily et al. 2003; Ritter 1991). Mispricing can occur when either the stock price is higher (e.g., underpricing) or lower (e.g., overpricing) than the offer price. Underpricing frequently occurs in firms undertaking an IPO and has been the dominant performance measure found in IPO research (Daily et al. 2003).¹

Ritter and Welch (2002) note that much of the extant research on underpricing can be categorized on the basis of whether asymmetric information or symmetric information is assumed. Asymmetric information theories relate to one side of the negotiation equation having more information than the other. Most of this literature deals with the set of negotiations between underwriters and secondary market investors (and thus studies the issue of mispricing). Interestingly, within the set of asymmetric information theories, researchers have asserted both sides of the issue, with some theories suggesting that underwriters have more information than secondary-market investors and some theories suggesting that secondary-market investors are more informed than underwriters.

Ritter and Welch (2002) note that symmetric information theories suggest that issuers underprice to reduce legal liability (Tinic 1988), when they cannot justify a higher price though the market is willing to pay significantly more (i.e., “leaning against the wind”), or when overall trading volume is high. Though not definitively stated, Ritter and Welch (2002) do not seem to support symmetric information theories. Ritter and Welch (2002) also note that there are newer theories on underpricing related to allocation of shares, with many of these theories related to the allocation of shares to institutional investors. This line of research is outside the scope of our research.

Loughran and Ritter (2002) found that underpricing resulted in US IPOs foregoing US \$27 billion between 1990 and 1998. They (Loughran and Ritter 2002) note that issuers have rarely complained about this loss and propose that issuers care more about their change in wealth rather than the level of wealth. This may not be the case for all issuers and owners, however. Daily et al. (2003, p. 287) note that this leaving money on the table approach “might be ill advised, as IPOs tend to underperform the broader market in the long run.” We agree with Daily et al.’s (2003) assessment. Given this, we are interested in which factors may be correlated with higher offer prices and total amounts raised. Secondarily, we believe that understanding the determinants of the offer price itself may help our understanding of the mispricing issue. As Ritter and Welch (2002, p. 1803) observed “the solution to the underpricing puzzle has to lie in focusing on the setting of the offer price, where the normal interplay of supply and demand is suppressed by the underwriter.”

Within the above asymmetric/symmetric categorization, our approach best fits within the asymmetric information literature. This paper contributes to the IPO literature in that it looks at multiple mechanisms that simultaneously affect the primary market, and in particular the offer price. Factors affecting the offer price have received less attention in the IPO literature. Specifically, we are interested in understanding which agency and market signals are related to the offer price and total offer amount raised, which may be of value to pre-IPO owners in their negotiations with underwriters and ultimately affect the bargain struck between these parties to the IPO. Although many of the issues and variables discussed have been

¹ Underpricing is so prevalent that the term has become synonymous with initial returns or first-day returns (Dalton et al. 2003, p. 272; Ritter and Welch 2002, p. 1802). Though we do not mean to use the terms underpricing and mispricing interchangeably, we primarily discuss underpricing as it has been the dominant phenomenon.

examined in the setting of the secondary market (e.g., underpricing), the literature is silent on many of these issues related to the primary market.

1.1 Signals within the negotiation

There are three sets of parties associated with the establishment of the offer: the pre-market owners, the underwriters, and the investors (Loughran and Ritter 2002; Krigman et al. 1999). Each set of parties sends “signals” that are interpreted by the other sets of parties as to what the offer should be (Loughran and Ritter 2002).

Signals are “observable characteristics attached to the individual [*sic* or entity] that are subject to manipulation by him” (Spence 1973, p. 357). We believe that newly formed organizations, in part, act in certain ways in order to create signals that inform potential investors of their worth, and thus increase the value of their offering.

Signals, however, do not come without costs (Leland and Pyle 1977) nor are all signals of equal value (Spence 1973). New firms, perhaps more than established firms, send signals to current and potential stakeholders. Among other things, these signals are meant to inform individuals and entities that: (1) the organization exists, (2) it has the managerial experience and expertise needed to prosper, (3) it has the proper corporate structure and mechanisms to ensure suitable direction, (4) it has the appropriate set of products and/or services to compete in its respective market(s), and (5) it has the requisite funding to pay its bills and accomplish its mission.

These signals can be a part of the negotiation process. We would expect pre-market owners to use these sets of signals to both attract underwriters (i.e., more reputable underwriters and a greater number of underwriters) and to increase the bargaining leverage (i.e., in terms of a higher offer price) with underwriters. The signals related to managerial expertise and proper corporate structure and mechanisms may play an important role in these relationships. Additionally, although these firms are private at the time of the IPO, we propose that the signals that the pre-market owners are sending are directly related to their becoming a public firm. Thus, their relationships should be viewed in light of publicly traded, not private, firms.

Signaling theory (Spence 1973) has long been used to describe IPO activity (e.g., Allen and Faulhaber 1989; Grinblatt and Hwang 1989; Ritter 1984a). In addition, signaling theory has been used to explain the relationship between quality and product price (e.g., Erevlles et al. 2001), new product pre-announcements and stock price (e.g., Mishra and Bhabra 2001), and dividend change announcements and stock price (e.g., Elfakhani 1998). Certo et al. (2001) noted that signaling theory has been used in the IPO context, but has not been applied specifically to governance issues within this context. This study extends Certo et al.’s study by addressing governance and equity issues related to the characteristics of the underwriters as well as the offer and include the signaling effects from the primary and secondary markets.

Related to these relationships and our model, our overarching theme is that pre-market investors, in part, create pre-market mechanisms (i.e., reduce the level of duality, offer board stock options) in order to position the firm in a manner that sends signals that the pre-market owners have the managerial experience and expertise needed to prosper, and that proper corporate structure and mechanisms are in place to ensure suitable direction. These signals are intended to inform underwriters of their business expertise. We propose that these signals are simultaneously related to the IPO’s ability to attract reputable lead underwriters and multiple underwriters. Additionally, we propose that there is a correlation between these pre-market signals and the offer price and total offer amount raised. In other words, we propose that pre-market signals are positively correlated with more reputable underwriters, more underwriters participating in the IPO, and higher offer prices and total offer amounts raised. We use path analysis to develop a model illustrating the relationships between these signals. We also provide alternative, competing models to enhance our understanding of these signals.

2 Theory and hypotheses

2.1 Agency signals

Agency theory has been the predominant perspective for examining issues related to governance (Daily et al. 2003; Zahra and Pearce 1989), IPOs (Ritter and Welch 2002), venture capital investment and

governance (Huse 2000), and equity ownership and financial performance (Dalton et al. 2003). Agency theory describes the relationship in which one party (the principal) delegates work to another party (the agent) on the principal's behalf. This study takes the perspective that many entrepreneurs create new ventures as instruments to bring innovations (e.g., services, products, or processes) to market, with entrepreneurship being defined as "a process by which individuals—either on their own or inside organizations—pursue opportunities without regard to resources they currently control" (Stevenson and Jarillo 1990, p. 23).

The pursuit of opportunity without regard to the control of resources leads many entrepreneurs to seek alternative financing via debt, venture capital, and/or equity via an initial public offering (Amit et al. 1990). By seeking external financing, entrepreneurs relinquish varying degrees of ownership and control over their businesses (McConaughy et al. 1996; Sapienza 1992). Relinquishment of ownership and control is consistent with Schumpeter's (1969) view of entrepreneurs as risk takers but not risk bearers. The separation of ownership and control is the central issue underlying agency theory (Fama 1980; Jensen and Meckling 1976).

An agency problem arises when cooperating parties have different attitudes toward risk; thus, the parties have varying preferences toward different courses of action (Eisenhardt 1989; Fama and Jensen 1983). A second problem exists in that it is often difficult and expensive to determine what the manager is doing and if it is in the best interest of the stockholder. Thus, there is asymmetric information between the owner and the manager/agent (Ross 1973). The issue of information asymmetry may lead to concealment and/or shirking on the part of the manager/agent. There are two means of addressing this issue: (a) surveillance or behavior control and (b) output control. Agency costs arise whenever there is a need to monitor the agent and the cost of doing so exceeds the benefit (Jensen and Meckling 1976). Agency costs are the sum of the cost of bonding, structuring, and monitoring contracts between agents (Jensen 1983).

Much of the agency literature, however, is concerned with large established firms (Dalton et al. 2003) with the study of small firms receiving less attention (Daily and Dalton 1992). Nevertheless,

agency problems are of concern as the entrepreneur's purpose in establishing the company may not be aligned with that of its shareholders (Amit et al. 2001; Kuratko et al. 1997). As Ross (1973, p. 134) observed, "[e]ssentially all contractual arrangements, as between employer and employee or the state and the governed, for example, contain important elements of agency."

From an agency theory perspective, a task of the pre-market owners is to configure the organizational and equity structures of the new venture to signal alignment with potential investors. The first investors that pre-market owners must attract are underwriters. Underwriters perform a unique role in that they can be both owners of and agents for the IPO simultaneously (i.e., they may acquire stock to resell in the secondary market and they may receive a fee). For pre-market owners the goal is to attract via signaling the greatest number of underwriters and the most prestigious underwriters (Higgins and Gulati 2003) in order to meet their goal of having a successful IPO (i.e., receiving a fair price for their stock and selling all the shares offered). Therefore, pre-market investors may configure their structures to signal to primary market investors (e.g., underwriters).

2.1.1 Boards of directors

The study of boards of new ventures has received little attention in the agency literature (Dalton et al. 2003). From an agency theory perspective, boards may be used as monitoring devices (Eisenhardt 1989). For example, Zald (1969, p. 99) observed that "[w]e usually think of boards of directors as agents of the 'owners,' but legally they are servants of the corporation vested with corporate control." The establishment of corporate control mechanisms sends signals to equity owners and potential owners that their interests are aligned with the "servants of the corporation." Agency theorists view control as the most important board task (Zahra and Pearce 1989). Research on control primarily deals with the independence of the board of directors and duality.

Duality refers to the situation where one person "wears two hats" (Baliga et al. 1996)—that of chief executive officer (CEO) and chairperson of the board. Proponents of duality argue that it allows for clear leadership at the strategy level and lessens competition between the CEO and chairperson. Opponents of

duality view it as a constraint on the board's independence, leading to entrenchment (Finkelstein and D'Aveni 1994) and signaling the absence of separation of decision management from decision control (Baliga et al. 1996). Agency theorists typically are opponents of duality (Boyd 1995).

Closely associated with duality is the concept of independence of the board. The phenomenon of insider-dominated versus outsider-dominated boards has been a topic of debate, with Dalton et al. (1998, p. 270) stating that there is "near consensus in the conceptual literature that effective boards will be comprised of greater proportions of outside directors."

Other researchers have observed another side of information asymmetry related to governing bodies. They note that outside directors lack the knowledge to make the critical decisions necessary to operate a firm and thus rely on inside board members to guide them in their decision-making (Baysinger and Hoskisson 1990); for example, the early research by Vance (1955) shows that firms with managerial control also had superior performance. Mace (1971, p. 127), however, viewed reasons for having inside board members as "essentially fallacious and specious," with Dalton et al. (1998) pointing out that the overall empirical work on the subject matter is inconsistent.

One might expect that within entrepreneurial firms there is less of a separation of ownership from control, as a founder of a new firm may serve in various capacities (i.e., an owner, manager, and board member). However, much of the entrepreneurship literature suggests that rapidly growing new firms quickly outgrow the founder's managerial capacity (Boeker and Karichalil 2002; Willard et al. 1992); for example, Daily and Dalton (1992) found modest performance advantages for entrepreneurial firms with greater proportions of outside directors. Further, Certo et al. (2001, p. 36) stated "a board composed predominantly of outside directors may signal that effective control systems are in place."

Thus we offer the following hypotheses:

Hypothesis 1a IPOs that do not have a founder serving in the dual role of chief executive officer and board chairperson send a positive signal as measured by lead underwriter prestige, number of underwriters, offer price, and total offer amount raised.

Hypothesis 1b IPOs that have a lower proportion of insiders than those that do not send a positive signal as measured by lead underwriter prestige, number of underwriters, offer price, and total offer amount raised.

2.1.2 *Venture capital involvement and preferred stock*

Another control-related area concerns the financing of the organization prior to the IPO (e.g., the pre-market). Stearns and Mizruchi (1993) suggest the importance of interlocks and cooptation between organizations and board members with respect to financing. Interlocks are mechanisms by which managers deal with uncertainty via coopting resources (Pfeffer and Salancik 1978). Agency theorists view interlocks to be a form of governance structure (Eisenhardt 1989; Stearns and Mizruchi 1993). Stearns and Mizruchi (1993), studying large manufacturing firms, found that the amount and type of funds borrowed by firms was positively associated with the presence of board members who were also financial institution representatives.

Cooptation and interlocks may be similar to venture capital involvement. Sahlman (1994, p. 35) defined venture capital as "active investment in private companies with high growth potential." The term "venture capital firm" refers to organizations having the predominant purpose of financing the founding or early growth of new companies that do not yet have access to the public securities market or to institutional lenders (Gupta and Sapienza 1992). Venture capitalists are active investors who seek to "add value" through ongoing, long-term involvement with developing businesses (Barry et al. 1990). The engagement of venture capitalists is consistent with this study's definition of entrepreneurship as "a process by which individuals... pursue opportunities without regard to resources they currently control" (Stevenson and Jarillo 1990, p. 23).

Historically, venture capitalists have been viewed in their financial intermediation roles (Hellman and Puri 2002). However, a growing body of research illustrates the limitedness of this view (Baum and Silverman 2004; Sahlman 1990). Venture capitalists also provide a multitude of services from acting as a "sounding board" for the entrepreneur (Sapienza

et al. 1996, p. 439) to actively participating in the dismissal of the chief executive officer (CEO) via board involvement (Bruton et al. 1997).

Although the venture capitalist's role may be especially important as entrepreneurs come from varied backgrounds with varying levels of business expertise (Drucker 1985), this view is not universal; for example, Amit et al. (1990) asserted that entrepreneurs have asymmetrical information regarding their skill levels. These authors argue that asymmetrical information leads to both moral hazard and adverse selection problems, with less able entrepreneurs choosing to involve venture capitalists.

The costs of debt, however, may outweigh the associated costs of engaging venture capitalists. There is growing evidence that venture capitalists add value, especially in highly innovative firms operating on the frontier of emerging technologies and markets (Sapienza 1992). Sahlman (1990, p. 473) stated that "[t]he venture capital industry has evolved operating procedures and contracting practices that are well adapted to environments characterized by uncertainty and information asymmetries between principals and agents." Signals are especially important in areas defined by asymmetric information. As Leland and Pyle (1977, p. 371) observed "where substantial asymmetries exists and where the supply of poor projects is large relative to the supply of good projects, venture capital markets may fail to exist."

Subsequently, entrepreneurs may recognize that venture capitalists represent expertise and experience in monitoring their investments and actions (Barry et al. 1990), and the staging of finance reducing agency problems and costs. Thus, venture capitalists are seen as bringing the expertise and discipline that are expected by the market to the new venture, which may be lacking within the entrepreneurial venture itself.

As with other financial intermediaries, venture capitalists may sit on IPO boards and take an equity position in these firms. This venture capital involvement may signal positive performance potential for the IPO (Daily et al. 2003; Sanders and Boivie 2003). The presence of venture capitalists may also affect the overall offer price, and attract higher-quality underwriters (Megginson and Weiss 1991); for example, Megginson and Weiss (1991) found that the presence of venture capitalists maximized the net proceeds to the pre-market IPO owners compared with IPOs

without venture capital backing. Stuart et al. (1999, p. 320) writing on venture capital involvement note that "an equity investor signals to a broader community that another organization is impressed enough with a young company to put up a stake in it." Additionally, venture capitalists may signal governance or control expertise. Thus, the following hypothesis is offered:

Hypothesis 2a IPOs that have venture capital investors on their board of directors send a positive signal as measured by lead underwriter prestige, number of underwriters, offer price, and total offer amount raised than those IPOs that do not have venture capital investors on their board of directors.

Perhaps in part due to their role venture capitalists also receive preferential treatment in that they often receive preferred stock (Megginson and Weiss 1991; Norton 1996). Common stock is subordinate to preferred stock and does not represent the alignment of incentives between pre-market owners and others. From an agency theory perspective, this alignment of incentives via the absence of preferred stock may send a positive signal to potential investors. Thus, the following hypothesis is offered:

Hypothesis 2b IPOs that have no preferred stock outstanding at or about the time of the initial public offering send a positive signal as measured by lead underwriter prestige, number of underwriters, offer price, and total offer amount raised than those IPOs that do have preferred stock outstanding.

Another area receiving recent attention in the literature has to do with the alignment of incentives at the board level with those of the shareholders. Beginning with Kesner's (1987) study of directors' stock ownership, researchers have been interested in the effect of board ownership on firm performance. Coles et al. (2001) studied board stock ownership and hypothesized that firms with a higher proportion of stock ownership at the board level would have better financial performance. Coles et al. (2001) found no evidence to support this hypothesis, with Daily et al. (2003) finding a lack of documented evidence for this practice. A difference in Kesner's (1987) and Coles et al.'s (2001) research from this study is that Kesner (1987) and Coles et al. (2001) studied only large firms.

Kesner (1987) also found that stock options were not available for most outside directors, with inside directors being granted options as part of their

management compensation. Halloran (2001) supports this finding by reporting that awarding options did not occur at the board level until the early 1990s. Boards are often comprised of members who do not own shares of the organization prior to their membership on the board. Stock options have become a means to compensate and also align incentives of board members with those of the shareholder. As Sanders and Boivie (2003, p. 171) observed, “markets expect stock-based incentives to have positive effects on shareholder wealth.”

Thus, the following hypothesis is offered:

Hypothesis 3 IPOs that compensate board members via stock options send a positive signal as measured by lead underwriter prestige, number of underwriters, offer price, and total offer amount raised compared with those that do not compensate board members via stock options.

The entrepreneurship literature also suggests that the IPO is viewed as both a means to raise additional capital and as an exit strategy for pre-market investors (Barry et al. 1990). Just as venture capitalists stage their entry into new ventures with each new phase, allowing for a reassessment of the team, the environment, and the project as a whole (Fried and Hisrich 1994; Sahlman 1994), the venture capitalists and other pre-market owners may wish to stage their exit acting as a “bonding mechanism for credible certification” (Megginson and Weiss 1991, p. 899). Hence, the retention of ownership by pre-market owners may send a strong signal to potential investors concerning the firm’s prospects (Barry et al. 1990; Certo et al. 2001).

Thus, we offer the following hypothesis:

Hypothesis 4 IPOs in which the pre-market owners whose stated intentions are to retain a greater percentage of equity in the venture after the initial public offering send a positive signal as measured by lead underwriter prestige, number of underwriters, offer price, and total offer amount raised than IPOs in which the pre-market owners retain a lesser percentage of equity.

2.2 Market signals

Pre-market parties are not the only ones that send and receive signals. Parties associated with the primary

and secondary markets also send and receive signals. Within the primary market, underwriters send signals to both pre-market and secondary investors. Similar to venture capital investment, endorsement by prestigious underwriters may influence the secondary market investor’s perception of the quality of a new issue (Baron 1982; Higgins and Gulati 2003; Stuart et al. 1999). In addition, Wolfe et al. (1994) noted that market risk factors (e.g., stock market volatility, and strength and profitability of market for new issues) affect the willingness of prestigious underwriters to underwrite an IPO.

2.2.1 Primary market

Underwriters (e.g., investment bankers) have three primary functions: (1) underwriting the new issue, (2) advising the pre-market owners as to the appropriate IPO offer price, and (3) distributing the IPO offer shares (Baron 1982; Baron and Holstrom 1980). We are primarily concerned with the second function; however, no single function can be performed without considering the others. The terms of the agreement between pre-market owners and underwriters take one of two forms: (1) a firm commitment contract or, (2) best effort contract (Benveniste and Busaba 1997; Certo et al. 2001). The main difference between the two contracts is that under a firm commitment contract the underwriter “guarantees” to sell a certain number shares at the negotiated offer price (i.e., in effect, the underwriter purchases the shares), whereas in a best efforts contract the underwriter has the option of returning the IPO’s money and shares should the prearranged amount of shares not be sold within the specified time period. The firm commitment contract has become the more common practice in general (Certo et al. 2001) and in our sample.

Since underwriters in a firm commitment contract may assume more risk than those in a best efforts contract, they may wish to lessen their risk by gaining additional information concerning the offer price (Benveniste and Spindt 1989). As mentioned above, the secondary market sends signals as it relates to IPO stocks; however, the underwriters may wish to gain additional information related to a particular stock.

Underwriters market IPO shares in two ways: the fixed price method and the bookbuilding method

(Benveniste and Busaba 1997). For the fixed price method, underwriters price an offering based on the informal information gleaned from potential investors. In this method the selling of the stock is sequential, with the investors signaling the price that they would pay for an offer (Benveniste and Busaba 1997). The second, more common form of marketing IPO shares (Benveniste and Busaba 1997) is bookbuilding. In the bookbuilding method the underwriter conducts a formal pre-market assessment in which potential investors make nonbinding commitments to purchase the offer. From these nonbinding commitments the underwriter is able to determine an aggregate offer price.

In this study, we do not know which marketing method the underwriters chose. However, we do know that certain factors related to the underwriters have been considered important by researchers and practitioners. The reputation of the underwriter has been viewed as a signal of overall offering quality (Carter and Manaster 1990; Carter et al. 1998; Higgins and Gulati 2003), as well as the number of underwriters involved in an offering.

Higgins and Gulati (2003, p. 246) assert that “[c]onvincing a prestigious investment bank to endorse a firm during its IPO is the primary responsibility of a firm’s top managers and board members—the IPO team.” The ability to attract, sort, and select attractive-looking new issues is central to the underwriter’s role. Leland and Pyle (1977, p. 383) suggest that “information asymmetries may be a primary reason that intermediaries exist.” Hence, underwriters view their reputation as being important as it helps generate business (Logue et al. 2002). Further, Carter and Manaster (1990) found that underwriters are protective of their reputation. Michaely and Shaw (1994) reinforce this view and note that a negative IPO outcome also may affect the investment bank’s entire array of activities. Thus, the following hypotheses are offered:

Hypothesis 5a IPOs associated with lead underwriters with a higher reputation send a positive signal as measured by number of underwriters, offer price, and total offer amount raised than IPOs associated with lead underwriters with a lesser reputation.

Hypothesis 5b Lead underwriter reputation mediates the relationships between the pre-market variables and the offer price and total offer amount raised.

Similar to venture capital investors, multiple underwriters may be drawn to especially attractive offers. Loughran and Ritter (2004) have shown an increase in the number of managing underwriters in recent years. They note that the “conventional wisdom” has been that this growth is attributable to an “increased emphasis on analyst coverage” (Loughran and Ritter 2004, p. 14). Hence, the increase in the number of managing underwriters may be an attempt to increase “the signal” to the market of an associated IPO. We believe that this signal may be magnified by not only additional managing or lead underwriters, but also by the addition in the number of underwriters in general. Thus, it is hypothesized:

Hypothesis 5c IPOs with a greater number of underwriters send a positive signal as measured by offer price and total offer amount raised than IPOs with a lesser number of underwriters.

2.2.2 Secondary market

There are two interrelated issues with regard to new offers: timing and pricing. Timing issues relate to stock issuance relative to the performance of the average existing publicly traded firms and new offers (Ibbotson and Jaffe 1975; Loughran and Ritter 1995). The relevant question for both researchers and practitioners is: “Is there a best time to issue stock based on the performance of the IPO market?” In other words, does the performance of the IPO market affect IPO performance? The IPO timing issue receiving the most attention stems from the concept of “hot markets” (Ibbotson and Jaffe 1975; Ritter 1984b).

Hot markets usually refer to a time in which the prices of initial stock offerings rise to a greater degree in the aftermarket (e.g., secondary market) than the historical average price of initial stock offerings (Ibbotson and Jaffe 1975). This underpricing issue creates the hot market phenomenon. The findings in the literature on the performance of companies that have an initial public offering during a hot market are mixed. Ibbotson and Jaffe (1975, p. 1038) suggest “it is quite possible that companies going public in a cold issue market are better off.”

The pricing of new issues is concerned with establishing a price at which to sell shares on the

common market and involves a “multi-round negotiation among the firm going public, the underwriter, and investors” (Krigman et al. 1999, p. 1023). Pricing is especially important to the new venture because residuals from the sale of common stock may not go to the new venture itself. Once a new venture has sold its stock, either to investors (e.g., underwriters) or on the open market, the venture no longer directly receives benefits or loss from additional sales of issued stock.

As noted earlier, research concerning the pricing issue has been extensive but inconclusive. For example, Tinic (1988) stated that IPOs are typically underpriced. Krigman et al. (1999) found that the market underreacts in choosing the initial trading price of an IPO. However, Ritter (1991) found underpricing to be a short-term phenomenon. Potential reasons for underpricing vary and include adverse selection (Rock 1982), conflict of interest (Gompers and Lerner 1999), asymmetric information (Baron and Holstrom 1980), moral hazard (Stoughton and Zechner 1998), and insurance against legal liability (Tinic 1988)—all agency issues. Loughran and Ritter (2002) provide a review of much of this literature and offer a prospect theory model as to why pre-market issuers “leave money on the table.”

Loughran and Ritter (2002, p. 437) also found that “first day returns are predictable based on lagged market returns.” Ritter (1991) concluded underpricing to be cyclical and lasting for several months at a time. Hence, the underpricing within the IPO market may send signals to other investors, creating a hot market. Signals of a hot market may also be received by the pre-market investors and affect their willingness to accept a low offer. This willingness may be especially true for certain industry sectors (Certo et al. 2001; Sanders and Boivie 2003). Additionally, the secondary market may also affect the underwriters’ willingness to engage in underwriting. Therefore, the following hypotheses are offered:

Hypothesis 6a IPO offer price and total amount raised are positively correlated with previous underpricing within a given sector.

Hypothesis 6b There is a positive correlation among previous underpricing within a given sector and the prestige of underwriters and the number of underwriters.

3 Research design

3.1 Data and sample

The sample consists of 182 healthcare (e.g., medical device companies, home health supply companies, hospitals, physician practice management companies) and biotechnology firms that registered for an initial public offering from January 1, 1996 through December 31, 1999 (and had initial registration forms available via the SEC (2002) Internet website). A listing of potential firms for inclusion in the sample was generated using Edgar Online’s (2002) (www.edgar-online.com) search engine in the industry sectors of medical services and devices, healthcare facilities and services, and biotechnology and drugs. Industry sectors are derived by standard industrial classification (SIC) codes.

We excluded firms that were filing a registration form for additional offerings. Subsequently, it was discovered that Edgar Online’s search engine did not list all IPOs. Additional names of IPOs were found from five Internet sources: (a) Ernst & Young’s Healthcare Sector (2003) (www.ey.com); (b) Bio.org (2003) (www.bio.org); (c) Biospace.com (2003) (www.biospace.com); (d) IPO Resources (www.iporesources.com); and (e) Security and Exchange Commission (www.sec.gov).

3.2 Measurements

3.2.1 Offer price and total offer amount raised

We used the offer price and amount raised stated in the IPO’s prospectus. For a small number of firms that only provided a range for the offer price, we used the mid-point, which is common practice among researchers (Loughran and Ritter 2002).

3.2.2 Lead underwriters’ reputation

Several Internet websites were used to identify lead underwriters. They include: www.finance.yahoo.com; www.ipomonitor.com; www.mediaquote.com; and www.ipomaven.com. The underwriters provided by these Internet websites were cross-matched/verified with those identified in the initial registration statements. Once the lead underwriter was determined, we

used the “tombstone” underwriter reputation ranks provided by Carter et al. (1998). Carter et al. (1998) extend the research by Carter and Manaster (1990) that developed the tombstone method. Carter and Manaster’s (1990) tombstone method is widely used by researchers (Higgins and Gulati 2003; Stuart et al. 1999). For the few underwriters within our study that were not ranked by Carter et al. (1998), we used the Carter and Manaster (1990) tombstone method to determine the underwriter’s ranking.

3.2.3 Number of underwriters

The aforementioned Internet websites used for underwriter reputation were also used to identify all underwriters associated with the IPO.

3.2.4 Founder duality

The “Directors and Executive Officers” section of the IPO’s initial registration statement contains the names and biographical information of all directors and executives associated with an IPO. We first determined if the chief executive officer also held the dual position of chairperson of the board. If so, we then determined if this individual had also been a founder.

3.2.5 Insiders

From the “Directors and Executive Officers” section of the IPO’s initial registration statement, we determined the total number of board members and divided this number by the number of board members who were also employees of the IPO.

3.2.6 Venture capital board involvement

Venture capital board involvement was primarily found in the “Principal Shareholders” and in the “Directors and Executive Officers” sections of the IPO registration statement. Venture capital firms were verified/cross-matched using Pratt’s Guide to Venture Capital Sources (1996), which is “one of the most comprehensive sources of detailed archival data on VCFs [venture capital firms] in the United States” (Gupta and Sapienza 1992, p. 351) and Fitzroy Dearborn International Directory of Venture Capital Funds 1998–1999 (1998).

3.2.7 Preferred stock outstanding

Often, pre-market owners maintain their ownership interest in the firm via preferred stock. This type of stock is preferable to debt but not aligned with that of the common shareholder (with many firms converting this equity into common stock). This information was obtained from the “Description of Capital Stock” section of the IPO registration statement.

3.2.8 Board stock options

The IPO’s board of directors is usually compensated by either all cash or a combination of cash and stock options. This information was compiled from the “Directors Compensation” section of the IPO registration statement.

3.2.9 Retained equity

The percentage of equity retained after the initial public offering is a continuous variable that represents the stated percentage equity of the IPO that the pre-market owners intended to retain. This information was found in the “Dilution” section of the IPO registration statement.

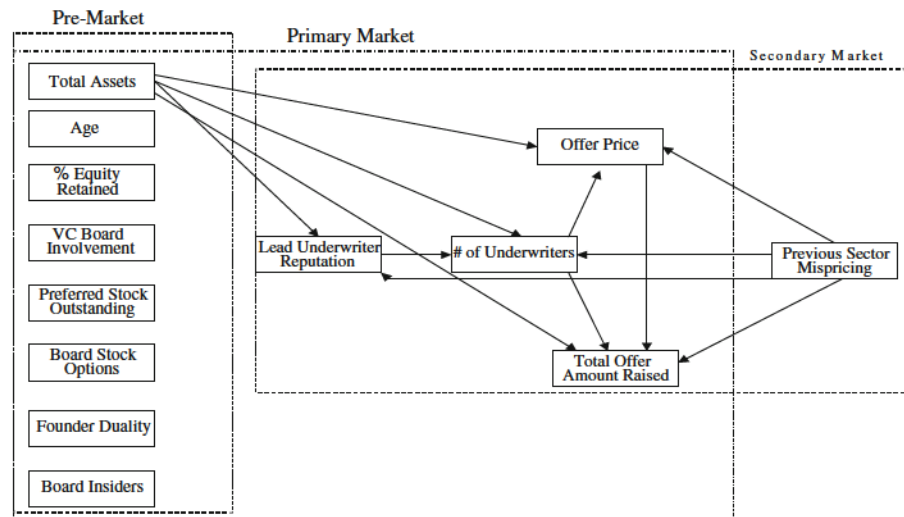
3.2.10 Previous sector mispricing

Mispricing is the difference between the offer price and the stock price at the close of the first day of trading. The Internet websites used to determine underwriters also provided stock price for the firms that remained active at the time of this study. For firms that had delisted, the stock price at the close of the first day of trading was extracted from back issues of the *Wall Street Journal*. Once the amount of mispricing was determined, each IPO was assigned a sector (i.e., they were classified either as biotechnology firms or healthcare firms). Each IPO by sector was then grouped by the quarter (i.e., January through March) that it went public. We then averaged this mispricing variable. Finally, we assigned each IPO with the average mispricing variable (by sector) from the previous quarter.

3.2.11 IPO assets

The variable “IPO assets” is the total assets of the IPO before the initial public offering. This information is

Fig. 1 Relationships within the theoretical model and market boundaries



found in the audited financial statements that are a part of the initial registration statement. We use the most recent financial fiscal year's data provided.

3.2.12 IPO age

The IPO's age is calculated as the number of years from the IPO's inception to the filing of the first initial registration statement, plus 1 year. The addition of 1 year recognizes the fact that a few firms were being organized and incorporated at the same time as the initial public offering was being undertaken.

3.3 Theoretical model

The theoretical model (TM) represents our view of the negotiation process whereby pre-market firms have certain characteristics in order to send signals to both primary and secondary potential investors. Our TM suggests that there are relationships among the pre-market characteristics and the: (1) selection of a prestigious underwriter, (2) number of underwriters, and (3) offer price and offer amount raised. Additionally, our TM shows that there is a relationship between the prestige of an underwriter and the number of underwriters (i.e., that a more prestigious underwriter is able to create a larger syndicate in order to magnify the signal). The TM also depicts a positive relationship between the prestige of the underwriter, the number of underwriters, the offer price, and total offer amount raised. Finally, the

model suggests that there is a direct relationship between previous secondary market mispricing (by sector) and the prestige of the underwriter, number of underwriters, offer price, and amount raised. Figure 1 illustrates our model and the boundaries within the pre-, primary, and secondary markets.

3.3.1 Competing models

Spence (1973) suggested that not all signals are of equal value. We believe this is especially true in the context of negotiations. We offer three competing models (not shown) to our TM. The respecifications to our TM involve changes in the relationships among the pre-market characteristics and the offer price and total offer amount raised (i.e., we eliminate direct relationships between independent variables and offer price and amount raised and retain all other relationships). Our rationale for having competing models (CMs) is that we wish to test a competing view that certain pre-market characteristics may attract more prestigious underwriters but may not have an effect on the offer price and total offer amount raised (i.e., the underwriters mediate these relationships). Additionally, within the underpricing literature, certain variables (but not others) have been found to be related to underpricing (Daily et al. 2003). We take a parsimonious view of model building and build our competing models based on where we have seen these variable most frequently studied together (i.e., our first competing model has total assets by itself which is the variable we found most frequently in the

literature; our final competing model represents a set of variables that we often found “bundled” in the underpricing literature).

Path analysis allows us to simultaneously view which pre-market characteristics correlates with the dependent variables. The path analysis method employs simple bivariate correlations to estimate the relationships in a system of structural equations. It is based on specifying the relationships in a series of regression-like equations that can then be estimated by determining the amount of correlation attributable to each effect in each equation simultaneously (Hair et al. 1998). Other statistical methods such as multiple regression have the limitation of only examining a single relationship at a time. Within our model, we are interested in simultaneously examining these relationships. We believe that simultaneously viewing these relationships more closely reflects the negotiation process that is occurring, with all parties sending and interpreting signals concurrently. Thus, path analysis (as a form of structural equation modeling) expands “the researcher’s exploratory ability and statistical efficiency” (Hair et al. 1998, p. 577). The generalized least-squares estimation technique is used.

Competing model A (CMa) proposes that the size of the IPO’s total assets alone among the independent and control variables has a statistically significant relationship with the number of underwriters, offer price, and total offer amount raised. Competing model B (CMb) proposes that, in addition to the IPO’s total assets, the percentage equity retained has a significant statistical relationship with the number of underwriters, offer price, and raised offer amount. Competing model C (CMc) proposes a model where the variables IPO assets, retained equity, venture capital board involvement, and founder duality have significant statistical relationships with the number of underwriters, offer price, and total offer amount raised.

4 Results

Table 1 presents the means, standard deviations, and correlations among the variables within the study. Significant positive correlations exist between offer price and total offer amount, underwriter reputation, number of underwriters, total assets, IPO age, and

venture capital involvement on the board, retained equity, and previous sector mispricing. A significant negative correlation existed between offer price and insiders on the board. Significant positive correlations existed between total offer amount raised and offer price, underwriter reputation, number of underwriters, total assets, venture capital board involvement, preferred stock, and retained equity. A significant negative correlation existed between total offer amount raised and insiders on the board.

Significant positive correlations were observed between the number of underwriters and underwriter reputation, total assets, venture capital involvement on the board, retained equity, and previous sector mispricing. Total assets were positively correlated with number of underwriters, IPO age, venture capital involvement on the board, and preferred stock. Founder duality was positively correlated with insiders on the board, and insiders on the board were negatively correlated with venture capital involvement on the board, board stock options, and retained equity. Preferred stock outstanding was positively correlated with board stock options and retained equity. Preferred stock outstanding was significantly correlated with retained equity.

Table 2 presents a comparison of goodness-of-fit measures for the theoretical model and the competing models. Results indicate that our theoretical model and competing model A provide “acceptable” fits for the data, but are not “good” fits for the data. CMb and CMc both fit the data well. Though slightly less parsimonious than CMb, we chose CMc as our final model due to its slightly better *p* value, goodness-of-fit index, and inclusion of variables related to the theoretical underpinnings of the study. Interestingly, results indicate that the models with both the largest number of relationships (TM) and the least number of relationships (CMa) did not fit the data well, and that it appears that the reputation of the underwriter does mediate some of the pre-market characteristics but not all.

Table 3 depicts the hypothesis tests for the TM and the CMs. The final model (CMc) explained 48% of the variance of the offer price, 45% of the variance of the total offer amount raised, 36% of the variance of the underwriter prestige variable, and 19% of the variance of the number of underwriters. Interestingly, the previous sector mispricing variable was not found to have a statistically significant relationship with any

Table 1 Descriptive statistics and correlation matrix

	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Offer price (LN)	2.29	0.408	1.00												
(2) Total offer amount raised (LN)	16.96	0.910	0.631**	1.00											
(3) Underwriter reputation (LN)	1.73	0.691	0.571**	0.516**	1.00										
(4) Number of underwriters (LN)	1.40	1.05	0.367**	0.356**	0.380**	1.00									
(5) IPO assets (LN)	15.98	1.51	0.550**	0.450**	0.382**	0.230**	1.00								
(6) IPO age (LN)	1.66	0.747	0.154*	0.098	0.151*	0.042	0.147*	1.00							
(7) Founder duality	0.368	0.483	-0.002	0.030	-0.101	0.144	0.136	-0.007	1.00						
(8) Insiders (LN)	1.66	0.033	-0.197**	-0.173*	-0.374**	-0.120	-0.154	-0.106	0.244**	1.00					
(9) Venture capital board involvement	0.511	0.501	0.239**	0.182*	0.428**	0.164*	0.239**	0.138	-0.142	-0.401**	1.00				
(10) Preferred stock outstanding	0.835	0.372	0.145	0.194*	0.323**	0.143	0.241**	0.166*	0.063	-0.135	0.276**	1.00			
(11) Board stock options	0.736	0.441	0.134	0.108	0.259**	0.117	0.120	0.035	-0.112	-0.173*	0.188*	0.137	1.00		
(12) Retained equity (LN)	4.25	0.152	0.395**	0.235**	0.316**	0.284**	0.295**	0.015	0.014	-0.318**	0.296**	0.178*	0.112	1.00	
(13) Previous sector mispricing (LN)	2.28	0.064	0.147*	0.080	0.122	0.159*	0.101	0.101	-0.005	0.003	0.052	-0.130	0.073	0.183*	1.00

n = 182

* Significant at 0.05 level

** Significant at 0.01 level

SD, standard deviation

Table 2 Comparison of goodness-of-fit measures for models

Goodness-of-fit measure	Theoretical model	Competing models		
		A	B	C
Likelihood-ratio chi-square (χ^2)	18.664	40.658	31.656	24.712
Degrees of freedom	8	29	26	20
Probability level (p)	0.017	0.074	0.205	0.213
Goodness-of-fit index (GFI)	0.984	0.965	0.973	0.979
Root-mean-square residual (RMSR)	0.019	0.027	0.023	0.020
Root-mean-square error of approximation (RMSEA)	0.086	0.047	0.035	0.036
RMSEA confidence intervals	0.034–0.137	0.000–0.079	0.000–0.072	0.000–0.077
Adjusted goodness-of-fit index (AGFI)	0.820	0.892	0.906	0.904
Parsimonious normed fit index (PNFI)	0.092	0.289	0.276	0.222
Hoelter (0.05)	151	190	223	231

of the dependent variables. Ritter and Welch (2002) note that the stage of the firm in its life cycle has been found to be significant. Our findings show no relationship between the age of the firm prior to IPO and any of the dependent variables.

Figure 2 illustrates the final model (CMc). We depicted only significant relationships within the model. The results indicate four significant relationships exist with offer price (i.e., total assets, percentage equity retained, lead underwriter reputation, and number of underwriters), but only two relationships with total offer amount raised (i.e., offer price and lead underwriter reputation). There are also four variables with statistically significant relationships with lead underwriter reputation (i.e., total assets, venture capital board involvement, preferred stock outstanding, and board insiders). There are three significant relationships with the number of underwriters (i.e., percentage equity retained, lead underwriter reputation, and founder duality).

5 Conclusions

The purpose of this study was to understand the relationships among pre-market, primary-market, and secondary-market characteristics. Utilizing agency and signaling theories, we developed a model describing these relationships. Our initial model did not fit the data well; however, two models directly related to the theoretical underpinnings of the study did fit the data. Taken together, these findings suggest that certain pre-market predictors did influence

primary-market factors, but the secondary-market predictor (i.e., previous market sector mispricing) did not. Nor did the secondary-market predictor affect the lead underwriter reputation or number of firms willing to engage in underwriting an IPO.

It has been suggested that the choice of underwriter is typically determined by the size of the firm and the underwriter's reputation (Logue et al. 2002; Ritter and Welch 2002). Our results were consistent with this finding, and we found that the most influential variable affecting the offer price was the lead underwriter reputation, which was more important than the size of the firm as measured by total assets.

Also of interest is the absence of relationships among total assets, the number of underwriters engaged in the IPO, and the total offer amount raised. Within the framework of this model and sample, the overall size of the offer is not correlated with the size of the firm (as measured by total assets) prior to the IPO. Additionally, there is not a significant relationship between the total amount raised and the number of underwriters. Furthermore, the more prestigious underwriters appeared to attract the larger IPOs (in terms of total assets and offer amount to be raised) and shared the risk with the greatest number of underwriters in terms of offer price but not overall total amount to be raised. One explanation may be that prestigious underwriters brought in more underwriters when the offer price was relatively high, but not necessarily when the overall total amount to be raised was relatively high. Thus, a high offer price may represent more risk for

Table 3 Results of hypothesis tests: theoretical model and competing models

Hypothesis	Description of path	Hypothesized direction	Theoretical model	Competing models		
				A	B	C
1a	Founder duality → lead underwriter prestige, number of underwriters, offer price, and total amount raised	—	−0.059 0.173* −0.047 0.013	−0.056	−0.061	−0.058 0.174** −0.038 0.015
1b	Insiders → lead underwriter prestige, number of underwriters, offer price, and total amount raised	—	−0.166* 0.017 0.078 −0.015	−0.166*	−0.173**	−0.172**
2a	Venture capital board members → lead underwriter prestige, number of underwriters, offer price, and total amount raised	+	0.225 −0.006 −0.002 −0.034	0.226**	0.224**	0.221** −0.008 −0.035 −0.028
2b	No preferred stock outstanding → lead underwriter prestige, number of underwriters, offer price, and total amount raised	+	0.157 0.008 −0.120 0.038	0.156*	0.166*	0.166**
3	Board stock options → lead underwriter prestige, number of underwriters, offer price, and total amount raised	+	0.118 −0.006 −0.021 −0.022	0.119	0.118	0.119
4	Retained equity → lead underwriter prestige, number of underwriters, offer price, and total amount raised	+	0.072 0.154* 0.183 −0.064	0.068	0.066 0.162 0.162* −0.059	0.067 0.154* 0.145* −0.054
5a	Underwriter reputation → number of underwriters, offer price, and total amount raised	+	0.333** 0.395** 0.206*	0.356** 0.412** 0.171*	0.309** 0.360** 0.194*	0.335** 0.368** 0.206*
5b	Number of underwriters → offer price and total amount raised	+	0.123 0.110	0.109 0.108	0.131* 0.103	0.128* 0.109
6a	Previous sector underpricing → offer price and total amount raised	+	−0.039 −0.025	−0.088 −0.005	−0.072 −0.013	−0.071 −0.014
6b	Previous sector underpricing → lead underwriter prestige and number of underwriters	+	0.055 0.080	0.056 −0.088	0.051 0.089	0.051 0.080
Control	IPO total assets → lead underwriter prestige, number of underwriters, offer price, and total amount raised	+	0.236** 0.017 0.362 0.123	0.235** 0.076 0.362 0.121	0.233** 0.056 0.337** 0.133	0.232** 0.017 0.343** 0.128
Control	Age → lead underwriter prestige, number of underwriters, offer price, and total amount raised	+	0.029 −0.021 0.067 −0.023	0.029	0.023	0.022
Squared	Offer price		0.490	0.473	0.483	0.483
Multiple	Total offer amount raised		0.455	0.456	0.454	0.455

Table 3 continued

Hypothesis	Description of path	Hypothesized direction	Theoretical model	Competing models		
				A	B	C
Correlation	Underwriter reputation		0.363	0.364	0.366	0.364
	Number of underwriters		0.200	0.161	0.182	0.199

Note. All coefficients reported in this table are beta coefficients (standardized)

* Significant at 0.05

** Significant at 0.01

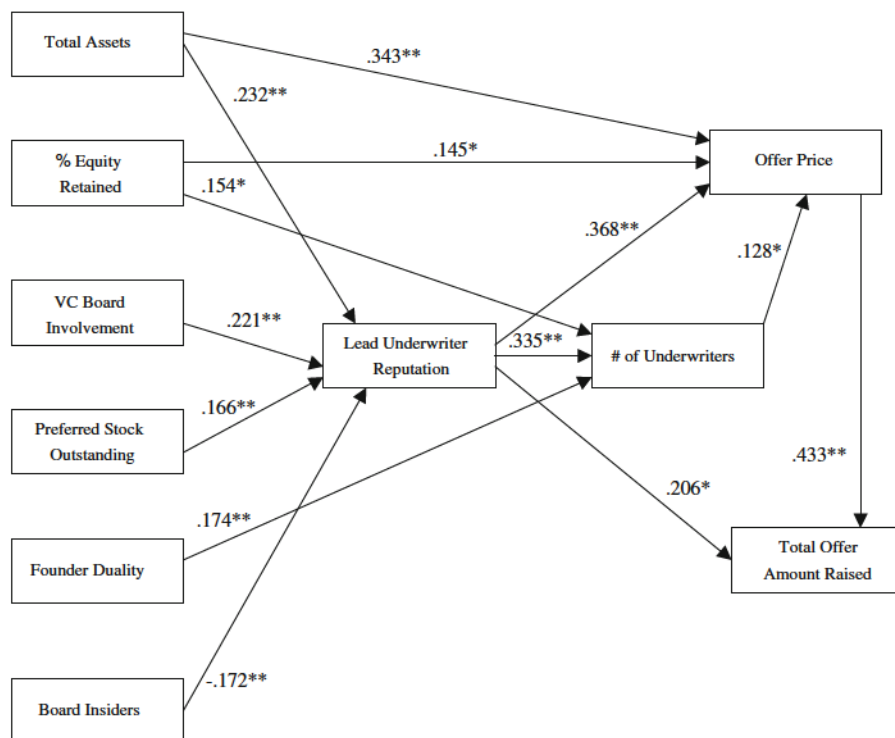


Fig. 2 Relationships within competing model C. Note: Only significant relationships are shown. * Significant at 0.05 level. ** Significant at 0.01 level. All coefficients reported in this table are beta coefficients (standardized)

the lead underwriter (and require a louder signal) than a larger offer in terms of total amount to be raised.

These findings suggest that healthcare and biotechnology entrepreneurs may wish to consider instituting these pre-market characteristics if their goal is to gain the highest offer price for their IPO. The results indicate that attracting lead underwriters with prestigious reputations is correlated with a greater number of underwriters (which may magnify the signal to a greater degree) and higher offer prices and larger offers. Venture capital board involvement

was also influential in attracting prestigious lead underwriters and may reflect a network effect (Stuart et al. 1999).

There are several generalizability limitations to the study. We have focused our study on healthcare and biotechnology firms and do not know if our findings apply to other industries and market sectors. Our sample size of 182 firms is modest. We also acknowledge that the overall IPO market during this time was “hot” and do not know if similar results would be found during a “cold” market. Another

limitation of this study is that we did not control for market liquidity on the first day of trading which is an important issue as the true demand for our firms' stock is an unknown quantity. Nor did we control for pre-market owners' allocations as others have suggested. Likewise, we limited our secondary-market indicator to one variable. Ritter and Welch (2002) indicate that market conditions are the most important factor in the decision to go public. We do not know what the consequence on our model would be if we were to consider the effects of mispricing within the overall market (i.e., would offer prices be higher shortly after the overall market underpriced 70% on average as compared with after a period of 7% underpricing?). We suspect that there is more to this issue than our findings indicate.

In conclusion, we have sought to understand the relationships among the various markets' characteristics associated with healthcare and biotechnology IPOs. The present study's contribution to the literature is threefold: (1) we focus on determinants of the offer price, which is an area that has not been sufficiently studied, (2) we study the effects of the mediating role of the underwriter(s) on the offer price and total amount raised, and (3) we use path analysis to model the effects of the three markets' (e.g., pre, primary, and secondary) characteristics simultaneously. The study's results suggest that certain pre-market and primary-market characteristics affect the offer price, and confirm the significance of the role of the lead underwriter.

References

- Allen, F., & Faulhaber, G. R. (1989). Signalling by underpricing in the IPO market. *Journal of Financial Economics*, 23(2), 303–323.
- Amit, R., Glosten, L., & Muller, E. (1990). Entrepreneurial ability, venture investments, and risk sharing. *Management Science*, 36(10), 1232–1245.
- Amit, R., MacCrimmon, K. R., Zietsma, C., & Oesch, J. M. (2001). Does money matter? Wealth attainment as the motive for initiating growth-oriented technology ventures. *Journal of Business Venturing*, 16(2), 119–143.
- Baliga, B. R., Moyer, R. C., & Rao, R. S. (1996). CEO duality and firm performance: What's the fuss? *Strategic Management Journal*, 17(1), 41–54.
- Baron, D. P. (1982). A model of the demand for investment banking advising and distribution services for new issues. *Journal of Finance*, 37(4), 955–976.
- Baron, D. P., & Holstrom, B. (1980). The investment banking contract for new issues under asymmetric information: Delegation and the incentive problem. *Journal of Finance*, 35, 1115–1138.
- Barry, C. B., Muscarella, C. J., Peavy, J. W., & Vetsuypens, M. R. (1990). The role of venture capital in the creation of public companies. *Journal of Financial Economics*, 27, 447–471.
- Baum, J. A. C., & Silverman, B. S. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups. *Journal of Business Venturing*, 19, 411–436.
- Baysinger, B., & Hoskisson, R. E. (1990). The composition of boards of directors and strategic control: Effects on corporate strategy. *Academy of Management Review*, 15(1), 72–87.
- Benveniste, L. M., & Busaba, W. Y. (1997). Bookbuilding vs. fixed price: An analysis of competing strategies for marketing IPOs. *Journal of Financial and Quantitative Analysis*, 32(4), 383–403.
- Benveniste, L. M., & Spindt, P. A. (1989). How investment bankers determine the offer price and allocation of new issues. *Journal of Financial Economics*, 24(2), 343–362.
- Boeker, W., & Karichalil, R. (2002). Entrepreneurial transitions: Factors influencing founder departure. *Academy of Management Journal*, 45(4), 818–832.
- Bouillet-Cordonnier, G. (1992). Legal aspects of start-up evaluation and adjustment methods. *Journal of Business Venturing*, 7, 91–101.
- Boyd, B. K. (1995). CEO duality and firm performance: A contingency model. *Strategic Management Journal*, 16(4), 301–312.
- Bruton, G., Fried, V., & Hisrich, R. D. (1997). Venture capitalist and CEO dismissal. *Entrepreneurship: Theory & Practice*, Spring, 21(3), 41–54.
- Carter, R. B., Dark, F. H., & Singh, A. K. (1998). Underwriter reputation, initial returns and the long-run performance of IPO stocks. *Journal of Finance*, 53(1), 285–311.
- Carter, R., & Manaster, S. (1990). Initial public offerings and underwriting reputation. *Journal of Finance*, 45(4), 1045–1067.
- Certo, S. T., Daily, C. M., & Dalton, D. R. (2001). Signaling firm value through board structure: An investigation of initial public offerings. *Entrepreneurship: Theory & Practice*, 26(2), 33–51.
- Coase, R. H. (1937). The nature of the firm. *Economica*, 4, 387–405.
- Coles, J. W., McWilliams, V. B., & Sen, N. (2001). An examination of the relationship of governance mechanisms to performance. *Journal of Management*, 27(1), 23–50.
- Dailey, C. M., Certo, S. T., Dalton, D. R., & Roengpitya, R. (2003). IPO underpricing: A meta-analysis and research synthesis. *Entrepreneurship: Theory & Practice*, 27(3), 271–295.
- Daily, C. M., & Dalton, D. R. (1992). The relationship between governance structure and corporate performance in entrepreneurial firms. *Journal of Business Venturing*, 7, 375–386.
- Daily, C. M., Dalton, D. R., & Rajapalan, N. (2003). Governance through ownership: Centuries of practice, decades of research. *Academy of Management Journal*, 46(2), 151–158.

- Dalton, D. R., Daily, C. M., Certo, S. T., & Roengpity, R. (2003). Meta-analyses of financial performance and equity: Fusion or confusion? *Academy of Management Journal*, 46(1), 13–26.
- Dalton, D. R., Daily, C. M., Ellstrand, A. E., & Johnson, J. L. (1998). Meta-analytic reviews of board composition, leadership structure, and financial performance. *Strategic Management Journal*, 19, 269–290.
- Drucker, P. (1985). *Innovation and entrepreneurship*. New York: HarperBusiness.
- Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of Management Review*, 14(1), 57–74.
- Elfakhani, S. (1998). The expected favorableness of dividend signals, the direction of dividend change, and the signaling role of dividend announcements. *Applied Financial Economics*, 8, 221–230.
- Erevelles, S., Roy, A., & Yip, L. (2001). The universality of the signal theory for products and services. *Journal of Business Research*, 52(2), 175–187.
- Fama, E. F. (1980). Agency problems and the theory of the firm. *The Journal of Political Economy*, 88(2), 288–307.
- Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. *Journal of Law and Economics*, 26(2), 301–326.
- Finkelstein, S., & D'Aveni, R. A. (1994). CEO duality as a double-edged sword: How boards of directors balance entrenchment avoidance and unity of command. *Academy of Management Journal*, 37(5), 1079–1098.
- Fitzroy Dearborn International Directory of Venture Capital Funds 1998–1999. (1998). Chicago: Fitzroy Dearborn.
- Fried, V. H., & Hisrich, R. D. (1994). Toward a model of venture capital investment decision making. *Financial Management*, 23(3), 28–41.
- Gompers, P. A., & Lerner, J. (1999). Conflict of interest in the issuance of public securities: Evidence from venture capital. *Journal of Law and Economics*, 42, 1–28.
- Grinblatt, M., & Hwang, C. Y. (1989). Signalling and the pricing of new issues. *Journal of Finance*, 44(2), 393–421.
- Gupta, A. K., & Sapienza, H. J. (1992). Determinants of venture capital firms' preferences regarding the industry diversity and geographic scope of their investments. *Journal of Business Venturing*, 7, 347–362.
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th ed.). Upper Saddle River: Prentice Hall.
- Halloran, M. (2001). Incentives for board members—a new look at pay for performance. *Directorship*, May, 27(5), 8–12.
- Hellman, T., & Puri, M. (2002). Venture capital and the professionalization of start-up firms: Empirical evidence. *Journal of Finance*, 57(1), 169–197.
- Higgins, M. C., & Gulati, R. (2003). Getting off to a good start: The effects of upper echelon affiliations on underwriter prestige. *Organization Science*, 14(3), 244–263.
- Huse, M. (2000). Board of directors in SMEs: a review and research agenda. *Entrepreneurship & Regional Development*, 12(4), 271–290.
- Ibbotson, R. G., & Jaffe, J. F. (1975). Hot issue markets. *Journal of Finance*, 30(4), 1027–1042.
- Jensen, M. C. (1983). Organization theory and methodology. *The Accounting Review*, 58(2), 319–339.
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership. *Journal of Financial Economics*, 3, 305–360.
- Kesner, I. F. (1987). Directors' stock ownership and organizational performance: An investigation of Fortune 500 companies. *Journal of Management*, 13(3), 499–508.
- Krigman, L., Shaw, W. H., & Womack, K. L. (1999). The persistence of IPO mispricing and the predictive power of flipping. *Journal of Finance*, 44(3), 1015–1044.
- Kuratko, D. F., Hornsby, J. S., & Naffziger, D. W. (1997). An examination of owner's goals in sustaining entrepreneurship. *Journal of Small Business Management*, 35(1), 24–32.
- Leland, H. E., & Pyle, D. H. (1977). Information asymmetries, financial structure, and financial intermediation. *Journal of Finance*, 32(2), 371–387.
- Logue, D. E., Rogalski, R. J., Seward, J. K., & Foster-Johnson, L. (2002). What is special about the roles of underwriter reputation and market activities in initial public offerings? *Journal of Business*, 75(2), 213–243.
- Loughran, T., & Ritter, J. R. (1995). The new issue puzzle. *Journal of Finance*, 50(1), 23–51.
- Loughran, T., & Ritter, J. R. (2002). Why don't issuers get upset about leaving money on the table in IPOs? *Review of Financial Studies Special*, 15(2), 413–443.
- Loughran, T., & Ritter, J. R. (2004). Why has IPO underpricing changed over time? *Financial Management*, 33(3), 5–38.
- Mace, M. L. (1971). *Directors: Myth and reality*. Boston: Harvard University.
- McConaughy, D. L., Dhatt, M. S., & Kim, Y. H. (1996). Agency costs, market discipline and market timing: Evidence from post-IPO operating performance. *Entrepreneurship: Theory & Practice*, Winter, 20(2), 43–57.
- Megginson, W. L., & Weiss, K. A. (1991). Venture capitalist certification in initial public offerings. *Journal of Finance*, 106(3), 879–903.
- Michaely, R., & Shaw, W. H. (1994). The pricing of initial public offerings: Tests of adverse-selection and signaling theories. *Review of Financial Studies*, 7(2), 279–340.
- Mishra, D. P., & Bhabra, H. S. (2001). Assessing the economic worth of new product pre-announcement: Signal theory and empirical evidence. *Journal of Product and Brand Management*, 10(2), 75–82.
- Norton, E. (1996). Venture capital as an alternative means to allocate capital: An agency-theoretical view. *Entrepreneurship: Theory & Practice*, Winter, 20(2), 19–29.
- Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations*. New York: Harper & Row.
- Pratt's Guide to Venture Capital Sources (1996). Wesley Hills: Capital.
- Ritter, J. R. (1984a). Signaling and the valuation of unseasoned new issues: A comment. *Journal of Finance*, 39(4), 1231–1237.
- Ritter, J. R. (1984b). The hot issue market of 1980. *Journal of Business*, 57(2), 215–240.
- Ritter, J. R. (1991). The long-run performance of initial public offerings. *Journal of Finance*, 45(1), 3–27.
- Ritter, J. R., & Welch, I. (2002). A review of IPO activity, pricing, and allocations. *Journal of Finance*, 55(4), 1795–1828.
- Rock, K. (1982). Why new issues are underpriced. *Journal of Financial Economics*, 15(1/2), 187–212.

- Ross, S. A. (1973). The economic theory of agency: The principal's problem. *American Economic Review*, 62, 134–139.
- Sahlman, W. A. (1990). The structure and governance of venture-capital organizations. *Journal of Financial Economics*, 27, 473–521.
- Sahlman, W. A. (1994). Insights from the venture capital model of project governance. *Business Economics*, 29(3), 35–38.
- Sanders, W. G., & Boivie, S. (2003). Sorting things out: Valuation of new firms in uncertain markets. *Strategic Management Journal*, 25, 167–186.
- Sapienza, H. J. (1992). When do venture capitalists add value? *Journal of Business Venturing*, 7, 9–27.
- Sapienza, H. J., Manigart, S., & Vermeir, W. (1996). Venture capitalist governance and value added in four countries. *Journal of Business Venturing*, 11, 439–469.
- Schumpeter, J. A. (1969). *The theory of economic development*. London: Oxford University Press (originally published in 1932).
- Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics*, 87(3), 355–374.
- Stehns, L. B., & Mizuchi, M. S. (1993). Board composition and corporate financing: The impact of financial institution representation on borrowing. *Academy of Management Journal*, 36(3), 603–618.
- Stevenson, H. H., & Jarillo, J. C. (1990). A paradigm of entrepreneurship: Entrepreneurial management. *Strategic Management Journal*, 11, 17–27.
- Stoughton, N. M., & Zechner, J. (1998). IPO-mechanisms, monitoring and ownership structure. *Journal of Financial Economics*, 49(1), 45–77.
- Stuart, T. E., Hoang, H., & Hybels, R. C. (1999). Interorganizational endorsements and the performance of entrepreneurial ventures. *Administrative Science Quarterly*, 44, 315–349.
- Tinic, S. M. (1988). Anatomy of initial public offerings of common stock. *Journal of Finance*, 43(4), 789–822.
- Vance, S. C. (1955). *Functional control and corporate performance in large scale industrial enterprise*. Amherst: University of Massachusetts.
- Willard, G. E., Krueger, D. A., & Feeser, H. R. (1992). In order to grow, must the founder go: A comparison of performance between founder and non-founder managed high-growth manufacturing firms. *Journal of Business Venturing*, 7(3), 181–195.
- Wolfe, G. A., Cooperman, E. S., & Ferris, S. P. (1994). An analysis of the underwriter selection process for initial public offerings. *Journal of Financial Research*, 17(1), 77–90.
- Zahra, S. A., & Pearce, J. A. (1989). Boards of directors and corporate financial performance: A review and integrative model. *Journal of Management*, 15(2), 291–334.
- Zald, M. N. (1969). The power and functions of boards of directors: A theoretical synthesis. *American Journal of Sociology*, 75(1), 97–111.